

INFLUENCE OF RECONSTITUTED TOBACCOS ON CIGARETTE BLEND

D. Jadraque, M^a Luisa Escribano, M^a Luisa Morata
Centro I + D. Tabacalera S.A. Madrid. ESPAÑA

SUMMARY

The objective of this work was to study several experimental blends containing different types of reconstituted tobaccos. The reconstituted tobaccos arose from two slurry processes and a paper-like process of manufacturing. A special sauce, that simulates a casing recipe, was added to two of the reconstituted tobaccos before blending. Also an inorganic salt, solved in the former casing, was used as a tracer of the reconstituted materials in the final blend.

Six batches of tobacco blends were used in this study. The first was a blend of natural bright tobaccos, and the other five were a blend 1:1 of the above described materials. Sizes distributions of the blends are obtained by sieving. An HPLC method, using conductimetric detection, provided the concentrations of several inorganic anions in the different size fractions of the blends. Propylglycol and benzylalcohol were also measured, via a GC method, in the same fractions of tobacco shreds.

The whole set of data gives some insight in the blend composition. Also the mechanical degradation of the reconstituted tobaccos is shown by comparing the distributions of the measured variables. In addition, the results for some of the components of the casing, measured in the total blends, provide some meaningful information about the ability of the reconstituted tobaccos in adsorbing certain types of casings.

INTRODUCTION

Reconstituted tobacco has been used increasingly for economical reasons in the manufacture of cigarettes, and as a result has been called the cigarette filler of the future (1). The proportion in which it is used in a blend (1,2,3) depends on the characteristics of the product used and its effects on organoleptic characteristics.

The study presented here concerns the effects of using various types of reconstituted tobaccos on the chemical composition of a blend, and their effects on stiffness of a blend of bright tobacco. Also studied here is the relationship between distributions found for the composition of various anions (5) and other compounds normally added to sauces (7), and the characteristics of each type of reconstituted tobacco used. A geometric model of shreds is proposed allowing for the interpretation of the distribution of humectants found in terms of surface adsorption, which explains the variations observed in the distribution of shred size within the total blend of cigarette filler depending on the type of reconstituted tobacco used and the dosage of sauce used.

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EXPERIMENTAL METHOD

Six blends were created, including one which contained bright tobacco and five others having a 1:1 proportion of the same bright and reconstituted tobaccos. The first of the reconstituted blends, RP, was made using a paperlike process, while the other two, R1 and R2, were made using slurry type processes.

The RPc and R2c blends were made using the same bright tobacco, while a 20%(w:w) of a sauce was added at room temperature to the reconstituted tobacco used in the RP and R2 blends before blending. The sauce was a solution of Zn (NO₃)₂ (3:7 w:w) in a mixture of Propylglycol, Benzylalcohol and Ethanol (3:3:1 w:w). The cased reconstituted tobacco was then left overnight.

The six blends were processed in the same conditions and were cut to a width of 0.8 mm and then used to produce cigarettes with a LabMax. The tobacco of these cigarettes was sieved (4) and 7 fractions were collected. Several anions were determined by HPLC and Propylglycol, Glycerine on Benzylalcohol were analyzed by GC. Experimental details can be found elsewhere (5, 6, 7, 8).

RESULTS

Some of the results for complete blends obtained are found in Table 1.

Nitrates experienced an increase in every case compared with the Control. An increase was also detected in RPc and R2c for nitrate ion, previously added for use as a tracer in the experimental sauce. The concentration of phosphate in the R1 blend increased as much as 5 times the average value of the others. The high concentration of phosphate ion suggests that it can be used as a good tracer for the presence of this type of reconstituted tobacco in a blend.

Table 1. - Chemistry of the reconstituted blends.

	Cl	NO3	PO4	SO4	Pg	Bz	Gl
Control	1.07	0.00	0.64	2.52	0.00	0.00	0.00
R1	1.37	1.06	2.44	2.52	0.54	0.00	0.66
RP	1.03	0.41	0.49	2.12	0.00	0.00	0.00
R2	1.43	0.97	0.54	1.81	1.39	0.00	1.58
RPc	0.93	1.37	0.36	1.94	1.77	0.95	0.00
R2c	1.61	2.50	0.55	1.85	4.20	2.20	1.19

If we consider the RPc and R2c blends, that were made with sauces for this study, it can be seen that the concentration of propylglycol has increased in both blends.

Now let us consider the distributions of compounds in the different fractions.

In figure 1 we see the normalized distributions of the shred size for the different blends.

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The results of a detailed comparison of the paired distributions carried out using a χ^2 test are included in table 2. In line 1, we observe that the distribution of shred size for the Control is indistinguishable from those of R1 and R2c. It must be pointed out that the distribution of shred size for the R1 blend has significantly different distribution of shred size from any other blend (line 2). Because the distribution of sizes for the R1 blend has the lowest average, we can conclude that this type of reconstituted tobacco has a greater brittleness than the other two.

The addition of our experimental sauce to the reconstituted tobacco of the R2 blend caused the distribution to shift to the left (line 3). In other words, an increase in concentration of humectant in the blend caused the blend R2 to be more brittle. On the other hand, the distribution of sizes for RP-RPc (line 4) shifted towards a larger shred despite the presence of 1.5% more propylglycol in RPc than RP.

Figure 2a shows the distributions for the concentration of some anions in the various fractions. In the control blend, phosphates are not uniformly distributed; higher concentrations were discovered in the fractions containing a greater shred size. This may be because phosphates are present in tobacco in 2 forms. At the same time, our aqueous extraction method is not completely efficient if compared to mineralization (6).

Blend R1 stands out because neither phosphates nor nitrates show a uniform distribution. The phosphates have a very narrow distribution with the mode in mesh 6 (0.5 mm) of nominal size, as found in the shred sizes. The distribution of phosphate and nitrates confirm the results found in the size distributions for the R1 blend.

Figure 2b shows the distributions for humectants. The R1, R2, and RP blends contain increasing concentrations of propylglycol and glycerine according to shred sizes.

Propylglycol is more uniformly distributed in the RPc and the R2c blends to which the synthetic sauce was added. Originally the RPc blend contained no propylglycol. These results indicate that a surface activity exists for the adsorption of these compounds, and only in the case of saturation of the active centers can a uniform distribution of humectant be obtained.

Unlike the results found in the blends not made with sauces, the increases found in propylglycol, benzylalcohol and nitrate are uniformly distributed in R2c and RPc. This leads us to believe that the quantities added saturated the active centers of the surface of this type of reconstituted tobacco.

DISCUSSION

If we postulate that the shred has a prismatic shape, the apparent surface of each fraction can be demonstrated as follows:

$$S_i = (1 + 1/n + 1/k) * 2w_i / p_t \quad [1]$$

In the same way, the basal surface of the shred is:

$$S_{bi} = 2w_i / p_t \quad [2]$$

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where w_i is the weight of each fraction g
 p is the solid density g/cm^3
 t is the thickness (average) of the shred $cm(10)$
 n is the ratio of width to thickness
 k is the ratio of length to thickness

Equations [1] and [2] provide values for the total and basal apparent surfaces for each fraction. They calculate the theoretical value for the surface of a prismatic shred containing no pores or wrinkles. In other words, the equations provide underestimations of the values obtained during adsorption experiments (10), which can be as much as 60 times greater than values calculated with the above equations. However, if we consider the surface wrinkles to be constant and independent of the size of the shred, the calculated values are proportional to the real values.

Assuming the components of the sauce are adsorbed mainly in the basal surface of each shred, similarly to moisture (10), a representation of basal surface versus the total quantity of sauce in each fraction (figure 3) is a straight line whose slope is proportional to the mass of sauce adsorbed per surface unit. The two continuous lines in the figure correspond to the distribution of total sauce for R2c and R2, and were calculated by adding to the original quantities measured in the R2 and RP blends those quantities that corresponded to the composition of our experimental sauce. It is supposed that adsorption took place only in the basal surface of the strip.

As seen in figure 3, RP has the lowest level of humectant adsorption per surface unit, while R1 shows an intermediate value between that of RP and R2. The graph also indicates that both blends R2c and R2, showed losses compared to their theoretical values, and the losses were greater ($\approx 63\%$) in the case of the R2 blend.

Table 3 shows the computed average diameters as computed from the sizes distribution, and also the index for the total surfaces computed from the equation 1 above.

Table 3. - Average diameters and total surfaces for the different blends.

	Ctrl.	R1	R2	R2c	RP	RPc
Diameter mm	1.379	1.227	1.946	1.283	1.775	2.060
Diameter index	100	89	141	93	128	149
T. surface index	100	101	95	100	98	95

The addition of sauce causes an increase of 5% in the total apparent surface of the R2 blend as a result of the comminution of the shred in the cigarette maker. This process is enhanced by the presence of pores in the surface of the shred, which become filled with humectant and act as tear points. On the other hand, the surface of the R2c blend adsorbs less sauce than R2 therefore causing it to spread within the blend, leading to the adhesion of shreds while lowering the total apparent surface by 3%.

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CONCLUSIONS

The concentration of anion phosphate is very high in a certain type of reconstituted tobacco, and can be considered as a good tracer for the presence of it in a cigarette blend.

The addition of different types of reconstituted tobacco to a natural blend of tobacco produces a change in the distribution of the shred sizes, and should be taken into account when considering the total weight of tobacco per cigarette.

The distribution of shred size is also influenced by the quantity of sauce added, because the brittleness of the shred is dependent on the surface adsorption of sauce, a fact to be considered when a blend containing a sauce is created.

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Fig.1. Size distributions

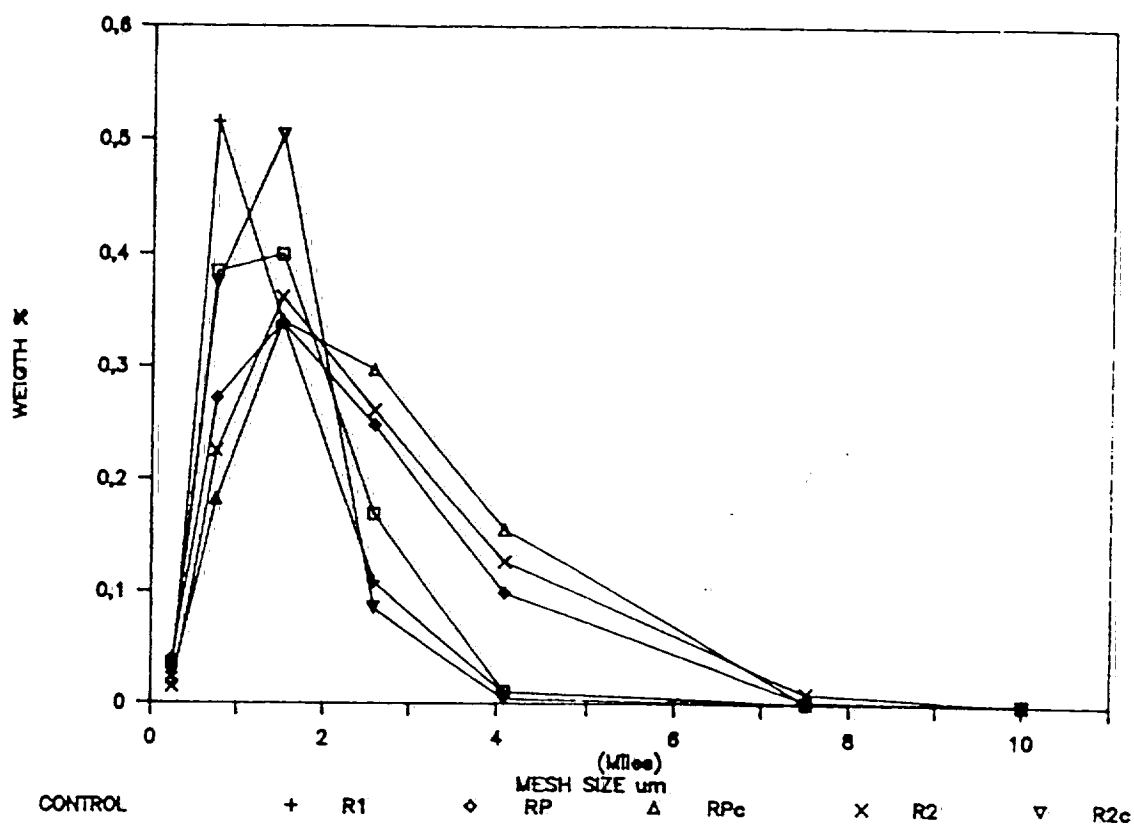


Table 2 .- Test Chi2 for the distributions

	Ctrl	R1	R2	RP	R2C	RPc
Ctrl.	--	7.72 NS	147. **	81.05**	7.38 NS	217.2**
R1		--	178.6**	108.4**	12.84**	263.5**
R2			--	5.36 NS	42.12**	5.4 NS
RP				--	32.06**	57.94**
R2c					--	58.53**

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Fig.2a. Anion distributions

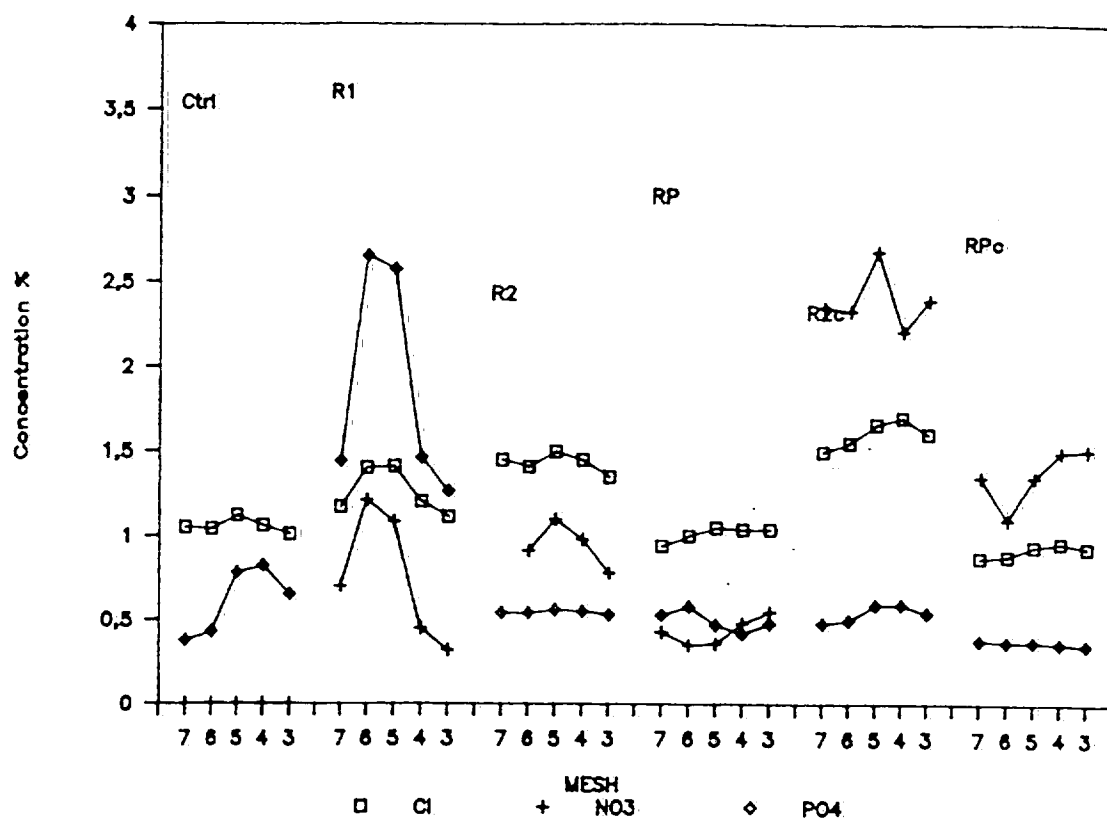
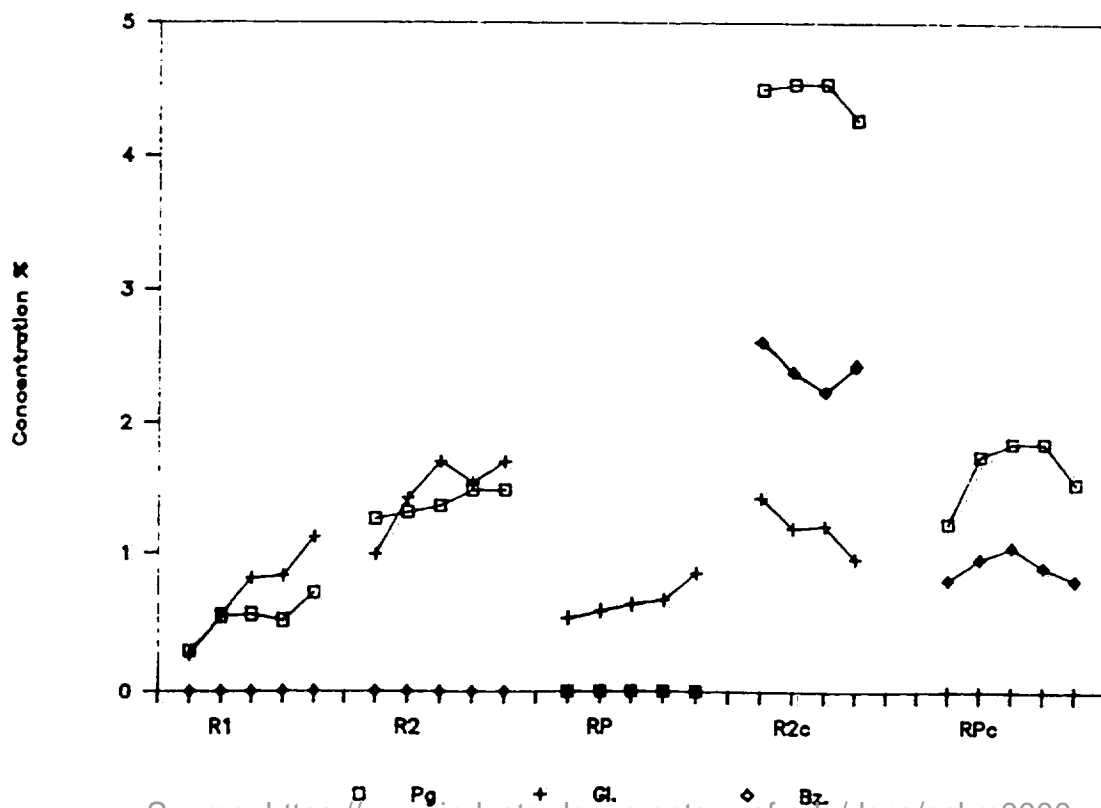
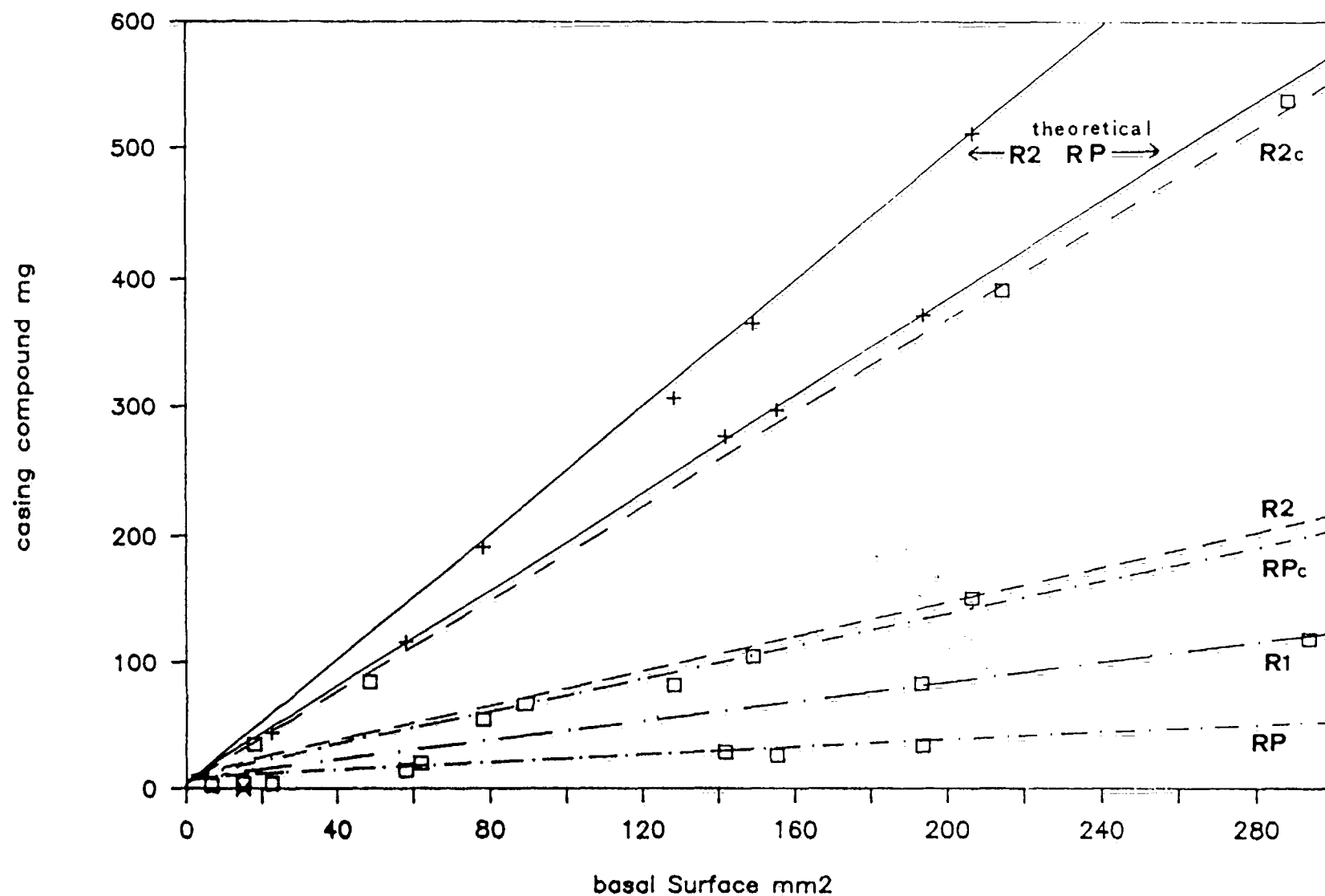


Fig.2b. Casing distributions



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Fig.3.Basal surface vs total casing



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